

AMENDMENTS TO THE CLAIMS

Upon entry of the present amendment, the status of the claims will be as is shown below.

This listing of claims will replace all prior versions and listings of claims in the application

1. (Original) A method for sending data through a provider network from an originating network to a destination network in a virtual private network (VPN), the method comprising:

encapsulating data link layer data from the originating network in a network layer packet;

determining whether a data link layer address of a destination device in the destination network is mapped to a network layer address of an egress line interface in the provider network;
and

when the destination device address is not mapped to the egress line interface address, broadcasting the network layer packet to a multicast address associated with the VPN.

2. (Original) The method for sending data through a provider network according to claim 1, further comprising:

when the destination device address is mapped to the egress line interface address, based on a previous transmission from the destination device, unicasting the network layer packet to egress line interface address.

3. (Previously Presented) The method for sending data through a provider network according to claim 2, further comprising:

adding a VPN identification number corresponding to the VPN to the network layer packet;

wherein the data layer link data from the network layer packet is decapsulated only when the VPN identification number is verified after the egress line interface receives the network layer packet.

4. (Canceled)

5. (Previously Presented) The method for providing broadband access to the VPN according to claim 21, wherein the IPv6 packet is discarded when the VPN identification number is not verified.

6. (Previously Presented) The method for providing broadband access to the VPN according to claim 21, in which the IPv6 packet includes an IPv6 address of an ingress line interface, which receives the LAN frame, as a source address and an IPv6 address of an egress line interface, to which the IPv6 packet is routed for verification, as a destination address, when the address of the destination device is mapped to the egress line interface.

7. (Previously Presented) The method for providing broadband access to the VPN according to claim 21, in which the IPv6 packet includes the VPN identification number in a header extension.

8. (Previously Presented) The method for providing broadband access to the VPN according to claim 7, in which the VPN identification number is included in a multiple of four octets of the header extension.

9. (Previously Presented) The method for providing broadband access to the VPN according to claim 7, in which the header extension further identifies a destination option type,

the method further comprising discarding the IPv6 packet when the egress line interface does not recognize the destination option type in the header extension.

10. (Previously Presented) The method for providing broadband access to the VPN according to claim 7, in which the header extension further identifies a VPN hop number, which indicates a number of line interfaces that transmit the IPv6 packet.

11. (Canceled)

12. (Previously Presented) The method for providing broadband access to the VPN according to claim 21, further comprising:

mapping an address of the egress line interface to the address of the destination device, based on address information received by the ingress line interface in a transmission from the destination device; and

transmitting subsequent IPv6 packets to the destination device using a unicast address of the egress line interface based on the mapping.

13. (Canceled)

14. (Currently Amended) The interface device for providing broadband access to the VPN according to claim 22 23, wherein the second interface device discards the IPv6 packet when it is not able to verify the VPN identification number.

15. (Currently Amended) The interface device for providing broadband access to the VPN according to claim 22 23, in which the IPv6 packet includes the VPN identification number in a header extension.

16. (Canceled)

17. (Previously Presented) The interface device for providing broadband access to the VPN according to claim 22, the second interface device comprising an egress virtual bridge corresponding to the egress line interface, the egress virtual bridge mapping an address of an originating device in the first LAN with the address of the ingress line interface after the second interface device receives the broadcast IPv6 packet;

wherein the second interface device is able to unicast subsequent IPv6 packets, directed to the originating device, to the address of the ingress line interface based on the mapping.

18. (Previously presented) A method of providing broadband access for a customer in a virtual private network (VPN), comprising a plurality of local area networks (LANs) interfacing with at least one telecom service provider (TSP) network, each TSP network comprising a plurality of interfaces corresponding to the plurality of LANs, the method comprising:

assigning a unique VPN identification number to the customer;

assigning a common multicast address to the plurality of interfaces and a unique unicast address to each of the plurality of interfaces;

receiving data from an originating LAN, the data being directed to a destination device in a destination LAN, the originating LAN corresponding to an ingress interface of the plurality of interfaces and the destination LAN corresponding to an egress interface of the plurality of interfaces;

when an address of the destination device address is not mapped to the destination LAN, encapsulating the data in a multicast packet, having the unique address of the ingress interface as a source address and the multicast address as a destination address; and

transmitting the encapsulated data to all interfaces corresponding to the plurality of LANs based on the multicast address;

wherein the frame is decapsulated only at the egress interface, and the egress interface forwards the frame to the destination device.

19. (Original) The method of providing broadband access according to claim 18, further comprising:

mapping the destination device address to the IPv6 address of the egress interface based on address information previously received by the ingress interface from the destination device;

when the destination device address is mapped to the egress interface, encapsulating the data in a unicast packet having the unique IPv6 address of the ingress interface as the source address and the unique address of the egress interface as the destination address; and

transmitting the encapsulated frame only to the egress interface, based on the destination address in the unicast packet.

20. (Previously Presented) The method of providing broadband access according to claim 19, further comprising:

entering the VPN identification number in one of the multicast packet and the unicast packet;

wherein the egress interface reads the VPN identification to verify that the received packet is associated with the VPN.

21. (Previously Presented) A method for providing broadband access to a virtual private network (VPN), the VPN comprising a plurality of local area networks (LANs) configured to

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interface with an IPv6 service provider network through broadband access links, the method comprising:

- encapsulating a LAN frame from an originating LAN of the VPN in an IPv6 packet of the service provider network;

- adding a VPN identification number corresponding to the VPN to the IPv6 packet;

- determining whether an address of a destination device in a destination LAN is mapped to an egress line interface; and

- when the address of the destination device is not mapped to the egress line interface, broadcasting the IPv6 packet to a multicast address associated with the VPN;

- wherein the IPv6 packet is received at the egress line interface based on the multicast address, the LAN frame being decapsulated and transmitted to the destination LAN when the VPN identification number is verified.

22. (Currently Amended) An interface device for providing broadband access to a virtual private network (VPN), the VPN comprising a plurality of local area networks (LANs) configured to interface with an IPv6 service provider network, the interface device comprising:

- an ingress line interface connectable to at least one LAN via a broadband access link;

- a receiver configured to receive a LAN frame from a first LAN of the at least one LAN at the ingress line interface corresponding to the first LAN, to encapsulate the LAN frame in an IPv6 packet, and to add a VPN identification number corresponding to the VPN to the IPv6 packet, the LAN frame being directed to a second LAN; and

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an ingress virtual bridge corresponding to the ingress line interface, configured to associate an address of a destination device in the second LAN with an address of an egress line interface of a second interface device;

wherein the first interface device broadcasts the IPv6 packet to a multicast address associated with the VPN when the ingress virtual bridge is not able to associate the address of the destination device in the second LAN with the address of the egress line interface of the second interface device; and

wherein the second interface device receives the IPv6 packet at the egress line interface based on the multicast address;

wherein the second interface device verifies the VPN identification number, decapsulates the LAN frame when the VPN identification number is verified, and transmits the LAN frame to the second LAN.

23. (Canceled)